

cross-diffusing metal and at least a portion of the polysilicon emitter contact to reduce the electrical resistance of the contact.

Please add the following new claims:

39. (New) The method of claim 1, wherein cross-diffusing metal with at least a portion of the polysilicon structure comprises diffusing metal from a metal layer that contacts the polysilicon structure into the polysilicon structure and diffusing polysilicon into the metal layer.

40. (New) The method of claim 1, wherein cross-diffusing metal with at least a portion of the polysilicon structure displaces polysilicon in the portion of the polysilicon structure.

41. (New) The method of claim 1, wherein cross-diffusing metal with at least a portion of the polysilicon structure displaces polysilicon in the portion of the polysilicon structure.

REMARKS

Claims 1-28 and 32-41 are now pending. Of these, claims 1-28 and 32-38 stand rejected under §112; and claims 1-5, 7-11, 28, 32, 33, and 35-38 stand rejected under §103.

Applicant reserves all applicable rights not asserted in or with this response, including, for example, the right to rebut tacit and explicit characterizations of one or more cited references, the right to swear behind one or more cited references, and the right to address the cited definition of "cross diffusion."

Status of Claim 34

Claim 34 is neither listed as subject to any art rejections, nor indicated as allowable pending resolution of the formal rejection. Accordingly, applicant respectfully requests clarification of its status.

Response to §112 Rejections for Indefiniteness

The Examiner rejected claims 1-28 and 32-38 under 35 USC §112, second paragraph, as indefinite, specifically asserting there is insufficient antecedent basis for "metal." To the extent the rejection is understood, applicant submits respectfully that the recitation of "metal" does not appear to cause any vagueness or ambiguity in the claims. Absent such vagueness or ambiguity, the recitation appears definite.

The Examiner appears to assert, in paragraph 9 of the Action, that the previous recitation of "substituting metal" suffered no ambiguity, and that changing the "substituting" to "cross-diffusing" renders "metal" ambiguous. Further, the Examiner asserts his "position is that to cross-diffuse a metal for at least [a portion of the polysilicon structure], a metal must be deposited or formed prior to cross-diffusion."

In further response, applicant agrees that the metal involved in the cross-diffusion must exist in some form prior to the cross-diffusion. However, the scope of the present invention is believed to be independent of when, where, or how the metal is introduced into the act of cross-diffusion. Moreover, to the extent the present claims entirely omit any restrictions as to the origin or placement or introduction or other attribute of the metal, applicant believes the claims are definite.

Accordingly, applicant requests respectfully that the Examiner reconsider and withdraw the rejections for indefiniteness.

Response to §103 Rejections Based on Tsai and Wolf

Claims 1-5, 7-11, 28, 32, 33, and 35-38 were rejected under 35 USC § 103(a) as unpatentable over Tsai (U.S. Patent No. 5,235,204) in view of Wolf (Silicon processing for the VLSI Era, vol. 2).

Regarding claims 1, 4, 5, 12, 20, 23, 32, 34, and 35 and their dependents, applicant respectfully submits that the Action fails to set forth a prima facie case of obviousness. Specifically, even if the combination of Tsai and Wolf were permissible it does not appear that the result of the combination would teach one to "cross-diffus[e] metal and ... polysilicon ... to

produce a metal emitter contact.” Indeed, if for sake of argument one assumes the Examiner is correct in asserting that Wolf teaches “cross diffusion,” there is still no teaching, nor even a suggestion, in either Tsai or Wolf to use “cross-diffusion” to produce or form a metal emitter contact as claims 1, 4, 5, 12, 20, 23, 32, 34, and 35 and their dependents require. Wolf reports, at §3.5.2.2 of page 126, that “[u]nder high current stresses, Si from polysilicon (rather than from the substrate) is transported into the Al.” Thus, at least as evidenced in the section cited to the support the rejection, Wolf teaches nothing about use of “cross diffusion” or even silicon-to-aluminum diffusion to produce, form, or otherwise fabricate an emitter contact.

Accordingly, applicant requests respectfully that the Examiner reconsider and withdraw the §103 rejections of claims 1, 4, 5, 12, 20, 23, 32, 34, and 35 and their dependents.

Claim 18 requires “heating at least the deposited metal and the polysilicon structure to urge diffusion of the deposited metal into the polysilicon layer.”

In contrast, neither Tsai nor Wolf teaches diffusion of a deposited metal into a polysilicon layer. Tsai as the Examiner has already admitted fails to meet this requirement. And, Wolf only reports diffusion of polysilicon into aluminum. In the sacrificial-barrier portion cited by the Examiner (bottom of page 126), Wolf states that “[u]nder high current stresses, Si from polysilicon (rather than from the substrate) is transported into the Al.” There’s no indication that aluminum is transported or diffused into the polysilicon.

Thus, even if were permissible to combine Tsai and Wolf as proposed, the resulting combination would not meet all the requirements of claim 18 and its dependents. Accordingly, applicant requests respectfully that the Examiner reconsider and withdraw the §103 rejections of claim 18 and its dependents.

Claim 28, as amended, requires “cross-diffusing metal and at least a portion of the polysilicon emitter contact to reduce the electrical resistance of the contact.” In contrast, neither Tsai nor Wolf teaches diffusion of a deposited metal into a polysilicon layer. Tsai as the Examiner has already admitted fails to meet this requirement. And, Wolf only reports diffusion of polysilicon into aluminum, specifically stating that “[u]nder high current stresses, Si from

polysilicon (rather than from the substrate) is transported into the Al." There's no indication that this diffusion of polysilicon into aluminum reduces the electrical resistance of the Wolf's contact.

Thus, even if were permissible to combine Tsai and Wolf as proposed, the resulting combination would not meet all the requirements of claim 28. Accordingly, applicant requests respectfully that the Examiner reconsider and withdraw the §103 rejection of claim 28.

Additionally in regard to all the rejected claims, applicant submits respectfully that the proposed combination of Tsai and Wolf is impermissible for at least the following reasons.

First, the rejection is based on the premise that [Wolf teaches cross-diffusion as a means for alleviating the problem of junction spiking." However, a careful reading of Wolf reveals that it does not teach that cross-diffusion itself alleviates junction spiking, but rather that a sacrificial barrier layer actually prevents the junction spiking. Thus, the proposed motivation is insufficient to justify the combination.

Second, the rejection is premised on impermissible degree of hindsight. The Action proposes that one would combine the teachings of Wolf with those of Tsai to prevent junction spiking. Yet, there is zero evidence that one of ordinary skill would have recognized that Tsai suffers from junction spiking. Indeed, the Action cites nothing to support this point, suggesting that the Examiner is tacitly taking Official Notice that Tsai suffers from junction spiking. As such, applicant respectfully requests, pursuant to MPEP 2143, that the Examiner provide an affidavit or other credible documentation that the one of skill in the art would comprehend Tsai as having a problem with junction spiking.

Third, Wolf teaches away from the rejected claims. Wolf teaches, at page 126, line 1, that "[i]nterdiffusion is the dominant process that destroys these contact structures" and further teaches that sacrificial barrier layers is useful to prevent the junction spiking that results from silicon diffusion out of a substrate into an aluminum contact. Thus, absent hindsight, it appears that one of ordinary skill confronted with the full contents of Tsai and Wolf would not be led or moved to construct emitter contacts through use of "cross diffusion."

Although some degree of hindsight is inevitable and acceptable in the examination process, there exists an impermissible degree of hindsight when a rejection relies on knowledge

beyond the ordinary skill at the time of the claimed invention. In the present Action, the Examiner has cited nothing that teaches or suggests use of cross-diffusion as a technique for fabricating metal emitter contacts. Wolf is cited, but it, at best, teaches diffusion in response to high current stress during integrated-circuit operation, not diffusion as a means for producing or fabricating metal emitter contacts. Thus, the present rejections are founded on an impermissible degree of hindsight.

For the above cited reasons, applicant respectfully requests that the Examiner reconsider and withdraw the §103 rejections based on Tsai and Wolf.

Response to §103 Rejections Based on Tsai, Wolf, and Aboelfotoh

The Examiner rejected dependent claim 6 as unpatentable over Tsai in view of Wolf, and further in view of Aboelfotoh (U.S. Patent 5,801,444). In response, applicant submits that this proposed three-part combination of Tsai, Wolf, and Aboelfotoh inherits the deficiencies of the proposed Tsai-Wolf combination. Accordingly, the rejection of claim 6 similarly fails to establish a prima facie case for obviousness and should also be withdrawn.

CONCLUSION

In view of these remarks, applicant requests respectfully that the Examiner reconsider and withdraw all the rejections. Additionally, applicant invites the Examiner to telephone its patent counsel Eduardo Drake at (612) 349-9593 to arrange an interview to resolve any further issues which may delay allowance.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

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By

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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: Commissioner of Patents, Washington, D.C. 20231, on this 22 day of November, 2002.

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